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A REVIEW STUDY ON SUSTAINABLE INDIGENOUS FARMING SYSTEM PRACTICE IN NAGALAND

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ABSTRACT

The present paper aims to explore the Indigenous farming practices in the regional context of Nagaland. Over the years, due to the need for improved techniques for increasing productivity and production of the farm, the local farmers, through their past farming experiences developed modified farming system, most suitable for their locality. It also signifies their way of life besides being sustainable and profitable. Alder based farming, zabo farming system and terrace rice cultivation are very significant indigenous farming system acceptable among the scientific community and adopted by the people in the state of Nagaland. In Alder based farming, Alder tree is incorporated in their jhum field. Ader based farming system has the potential to rejuvenate the vegetation and soil fertility at the faster rate in jhum land as compared to the normal jhum land. Zabo farming system is an integrated model of farming whereby farmers maintain a protected forest, water harvesting pond, livestock components and paddy cultivation along the slope of the hills. Terrace Rice Cultivation is the cultivation of paddy on the terrace area of hill slope with a laid out terrace with impounding of water brought from the upward stream.

KEYWORDS: Nagaland, Indigenous Jhum, Ader Based Farming System & Zabo

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Original Article

1. INTRODUCTION

Nagaland is a mountainous state in the north eastern region of India, located between 93°20'to 95°15'E longitude and 25°6'-27°4'N latitude with a total geographical area of 16,579 km2. About 71% of the population is dependent on agriculture and related activities as per 2011 census. Shifting cultivation also known as jhum cultivation or slash and burn is the most predominant farming practices in the state. Nagaland state has high potential of becoming leaders in organic production and export of many high value agricultural and horticultural crops, as Nagaland is considered as organic default, due to the fact that the green revolution period in India does not touch the hilly state North east India and Nagaland in Particular. Increasing population has led to reduction in jhum cycle which was normally 7-8 (seven to eight) years to 4-5 (four to five) years depending on the population and tribal practices. This leads to resulting land degradation, lower productivity and non sustainability of jhum field. It is believed that the old age practice of shifting cultivation dates back to as old as Neolithic period around 7000 BC (Borthakur, 1982). The socio-cultural life of the practicing communities is woven around it and is regulated according to jhum calender (Katherine, 1991). Today, scientists are of the opinion that jhum cultivation is a natural exploitative system, wherein the land and natural resources are not managed optimally and is considered to be one of the major causes of deforestation and inefficient land use with low productivity and return over investment (Gupta, 2005). Indigenous traditional farming practices have a long history since the inception of human settlement in the hill region of Nagaland. Over the years, due to the need for improved techniques for increasing productivity and production of the

farm, the local farmers through their past farming experiences developed modified farming system most suitable for their locality and adaptability to local environmental condition without depending on high cost external inputs, machinery labour, capital etc. In the state of Nagaland, indigenous farming system such as Alder based farming system, Zabo farming system and wet terrace rice cultivation are practiced as an alternative of jhum farming. The present article make an effort to elaborate the significance and practices of indigenous Alder based farming, Zabo farming system and wet terrace rice cultivation practices in Nagaland, which are practiced by local farmers in the state as an alternative of old age faulty practices of shifting cultivation.

2. INDIGENOUS FARMING SYSTEM IN NAGALAND

Tribal farmers in North eastern state of India developed many alternative farming practices which are indigenous in nature evolved through their farming experiences and inherent skills suitable to their locality. The fact which must be most appreciated is that, indigenous farming model are significantly efficient, sustainable without depending on expensive external inputs with only judicious use of locally available inputs and resources. Lack of proper documentation, ignorance and subsequent dissemination across similar agro-ecological zones either through farmers' participatory programme or other modes of mass media exploration are to be blamed for the current confinement. Different sustainable indigenous farming practices and knowledge exist among the tribals of Nagaland, which is considered as their way of life by the local farmers in their farming, which could be explored and can be potentially utilized for overcoming various constrains and loopholes related to jhum cultivation practiced in the state of Nagaland and other hilly region of India. Indigenous technical knowledge could be the best option for successful management of jhum farming which pose threat to many natural ecosystems. Many of the jhum areas could be changed into Settled agriculture using traditional soil and water conservation measures. If many of the jhum areas are converted to Settle agriculture, there could be solutions to the soil erosion, food production and conservation of flora and fauna, which alternately leads to sustainable agriculture.

2.1 Alder Based Farming System

Alder (Alnus nepalensis) based farming system is one of the sustainable and profitable indigenous farming practices, commonly seen in Kohima and Phek district of Nagaland in India. In this system of farming, crops are grown as intercrop with Alder trees. The indigenous Alder based farming system is an efficient system of sustainable agricultural farming system developed and practiced since time immemorial by tribals in Nagaland (Gokhale et al., 1985; Das et al., 2009; Singh, 1992).

The Alder based farming system is a unique self sustainable farming practiced by Angami tribes of Khonoma village, Kohima district, Nagaland. The basic principle in growing Alder (Alnus nepalensis) is that, beside nitrogen fixation and bio-mass production in the field, the farmers obtain fuel wood after the pollarding of the tree. The biomass production as well as the nitrogen fixation ability of soil enables to rejuvenate the soil fertility at the faster rate as compared to normal jhum land. As Alder can be potentially grown on less fertile and degraded land, it is found most suitable and widely acceptable tree species for rejuvenating jhum land among the local farmers. Traditionally, Alder (Alnus nepalensis) based farming system is considered as an efficient and sustainable land utilization system widely practiced in Khonoma village under Kohima district of Nagaland (Rathore et al., 2010; Das et al., 2012). Alder tree can be easily grown in low fertile land and Alder can be incorporated in the jhum field and other wasteland for enrichment of soil and making the land more productive (Das et al., 2012). Taking advantage of the nature of Alder trees' ability to fix

atmospheric nitrogen, the farmers in several villages across Nagaland have incorporated these tree species into their jhum system. A large number of crops such as rice, tapioca, potato, colocasia, large cardamom, turmeric, etc., are grown as intercrop with Alder trees. It was also revealed that the root nodule formation by Alder tree enriches the soil by nitrogen fixation and also prevents soil erosion due to the spreading nature of its roots (Das et al., 2012). In this system of sustainable farming, the seedlings of Alder tree are planted in jhum field with a wild spacing of approximately 4 metres (four metres) between plants and 5 metres (five metres) between rows depending on the slopes of the land cropping pattern of the farmer. In the first year, primary crops (rice) and secondary crops (colocasia, tomato, chilli, tapioca, potato, beans etc.,) are grown as mixed in the jhum field. In the second and third year, the same cropping pattern is followed on the same land. Subsequently, the jhum land is left uncultivated for about three to four years in order to allow the trees to attain certain height and rough fissures on the bark. Generally, pollarding is done, when the tree attains a height of about 2 metres (two metres) and clearing of the forest is done to resume the cropping. Pollarding operation is usually when the alder tree is around 5-6 (five to six) years of age and bole circumference of about 90-100cm (ninety to hundred centimetres). The main trunk of the tree is cut horizontally at a height of 2 metres (two metres) above the ground surface and followed by covering the exposed cut portion of the trunk with mud and straw to avoid the losses of sap and drying. A stone slab is placed on the covered portion of the trunk so as to facilitate the uniform sprouting of new shoots. In the first year, the sprouted shoots are allowed to grow and from the second and subsequent year only, few healthy shoots are retained and pruned. These shoots are allowed to grow till the next jhum cycle and the same process is repeated (Cairns, 2007; Pulamte, 2008; Das et al., 2012). The pruned branches are used for domestic fuel wood which also has lots of economic value. Alder based jhum cultivation can reduce fallow period and increase yield of production as compared to the normal jhum cultivation.

The symbiotic relationship between A nepalensis with nitrogen-fixing actinomycetes of the genus Frankia has also been recognized by some tribal farmers in Nagaland. Alder based farming is in practice since time immemorial, such that alder trees which are more than 200 years are found in farming areas. The total litter yield of Alder depends on the number of plants and amount of N fixed varies between 48.3 kg/ha (60 trees/ha) to 184.8 kg/ ha (625 trees/ha). Besides fixing atmospheric N, the litter added to the soil provides phosphorus, potassium, calcium and other nutrients through the addition of biomass (Sharma and Prasad, 1994; Sharma and Singh, 1994; Rathore et al., 2010).

2.2 Zabo Farming System

Zabo farming system is a sustainable indigenous farming model which comprises of integrated agricultural activities such as forest land for silviculture, water harvesting, animal husbandry and paddy cultivation along the slope of the hills. The word “Zabo” means impounding of water in local dialect. Zabo farming system is an integrated model of farming, whereby, farmers maintain a protected forest on the hill top along with livestock components, water harvesting structures is also maintained to collect the runoff water, which is used for irrigation purpose for the crops grown at lower elevation. Zabo farming system is a combination of enterprise which can be compared to integrated faming system. Zabo farming was originated in Kikruma village of Phek district of Nagaland. The area under zabo has been increasing due to its sustainability and adoptability to the local villagers in Nagaland. It also encompasses management and protection of forest land, water and biodiversity which are inbuilt aspects of this practice.

Zabo farming system comprises of well maintained forestry on the upper elevation of hill, provision for water harvesting structure in the middle for livestock and paddy fields, situated at the lower elevation. Silviculture or forest area is kept in the upper most portion of hill slope in which forest area protects the hilltop portion of the zabo system by

defending from rainfall striking over its surface by its vegetation. The presence of vegetation intercepts more amount of rainfall during the rainy days. Plant rooting and netting system helps to infiltrate more rainwater into the soil, which reduces runoff. The infiltrate water which flows down the slope as sub-surface flow, which makes water available in the downstream even during the non-rainy seasons. Below the forest area, there are constructions of terraces for storage of water. The livestock are reared below the forest area, which increases the soil fertility, as the run-off water collect the manures from livestock is collected in the field below it. Paddy is cultivated below livestock area at the foothills. Paddy fields located at the foothills helps to retain maximum water due to seepage and sub-surface flow from higher elevation to lower elevation by gravitational forces. Paddy fields get organic manure from livestock and the water structure at the upper elevation is used for livestock and irrigation purpose in the paddy cultivation. Sometimes, a water runoff is directly taken into the rice field when the terrains do not allow for construction of water storage pond. Rice husk and other boulders are also used on shoulder bunds of the terrace paddy fields, so as to avoid excessive runoff (Dabral, 2002).

Zabo farming is strategically located on the slope of the hills which is a combination of uncultivated forest land on top, provision for water collection pond in the middle as well as animal husbandry components and paddy fields at lower elevation along the slope of the hill. For the system to be economical, approximately 2 ha of catchment area is maintained under forest cover which acts as a source of water to the water collection ponds for maintenance of livestock and irrigation water for the paddy fields. Livestock components within the system such as cows, goats, pig, poultry etc., are commonly kept and are also allowed to loose in open forest area from the enclosure. The livestock yards are often constructed below the water harvesting pond and the water from the pond is allowed to pass through the livestock yard before diverting it to paddy field for irrigation purpose, as it serves as good source of nutrition to crop. Under Zabo system, the soil becomes rich in organic matter and available nutrient contents therefore, gives good production and productivity of paddy even without using external inputs. In addition, fish is reared by digging small pit in the middle of paddy field which provides shelter for fish during dry period. In this system, long duration (170-180 days) local rice varieties are grown and transplanting is done in June which is generally harvested in the month of October and early November. The farmers get a rice productivity of about 3-3.5 t/ha which is comparatively higher than other method of farming.

2.3 Terrace Rice Cultivation

Terrace Rice Cultivation is one of the indigenous method of rice cultivation practiced in the state of Nagaland mainly by the tribe of Angami and Chakhesang. This system of growing paddy has been in practice by the tribals in Nagaland and has significant cultural and economic contribution to the farmimg community of the Nagas. It comprises of cutting the sloppy land into a unit of terrace across the slop. Most of the terraces that, anyone comes across in these regions could be as old as the village and that would mean not less than 300 years old.

Terrace Rice Cultivation is a system of irrigated agriculture for growing rice also traditionally known as, Pani Kheti in Nagaland. Pani Kheti is successfully practiced in the district of Kohima and Phek district as well as in some parts of Nagaland. Pani Kheti is the cultivation of paddy on the terrace area of hill slope with a laid out terrace with impounding of water brought from the upward stream. Terrace cultivation is mostly constructed in the area having clay soil of good water holding capacity. Good quality terraces are constructed even on the high steep terrain up to 100% slope and even more. Terraces could retain water level between 8 to 12 cm depth depending upon the high of the shoulder bund, (Laishram and Devi, 2018). In this system, supply of water is ensured by diverting the water from the upstream through irrigation channels, in which, water feeds the paddy field at the lower elevation. In this system of paddy cultivation, mostly

local and landrace varieties of rice are grown by the farmers depending on the preferences of the family for consumption and adaptability of the crop. Planting of paddy generally starts at the month of May/ June and harvesting is done in the month of late October and continues till November.

3. CONCLUSIONS

Indigenous farming system which has been in practice by the farmers of the region is found to be sustainable and profitable to the farmers. These types of farming practices which the farmers adopted are based on their inherent knowledge are topographical and regional specific and need extensive research to yield significant outcome. Indigenous farming system practiced by tribal farmers has promising future, if exploited with proper research strategies.

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